



UNIVERSITI PUTRA MALAYSIA

**DEVELOPMENT OF A TRACTOR MOUNTED PEANUT
HARVESTING EQUIPMENT**

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**DEVELOPMENT OF A TRACTOR MOUNTED PEANUT
HARVESTING EQUIPMENT**

By

ELNOUGOMI ABDELGADIR OMER MUSSAD

**Thesis Submitted in Fulfilment of the Requirements for the Degree of
Doctor of Philosophy in the Faculty of Engineering
Universiti Putra Malaysia**

January 2001



*Dedicated
to
My*

**Parents ABDELGADIR, SKEENA
Brother and sister ABUBAKAR, NAHID
Wife, sons and daughter, MANAL, MUHAMMAD, MUHANAD, MRWA**

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Doctor of Philosophy.

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January 2001

Chairman: Associate Prof. Dr. Ir. Desa Ahmad

Faculty : Engineering

A peanut harvesting equipment suitable for operation by a 35hp tractor has been designed, developed and tested at the Department of Biological and Agricultural Engineering, UPM, Malaysia. The equipment consists of adjustable V-shaped digging blade where the angle of penetration can be easily adjusted with the help of bolts and nuts. Double discs lifter for gripping the loosened plant above the soil surface follows the digging blade. The loosened plant enters into a threshing mechanism, which consists of two cylinders with different number of fingers to achieve the stripping operation without dragging and clogging the pods then transfers them to the tank at the end of the equipment via a conveyor.

Light weight and durable materials were chosen to fabricate most of the peanut harvesting equipment parts. Therefore, in terms of weight, the equipment was lighter (about 315kg) compared with other existing machines (400kg). This facilitates easy hitching and transporting. Overall the peanut harvesting equipment was designed, fabricated, utilised and maintained using local resources and skill, with initial and fabrication cost of about US \$1455.

Soil moisture content was significant parameter for harvesting peanut crop in a single operation. This new equipment was designed for higher soil moisture content. The previous machines were operated below 30% soil moisture content. It was also found suitable and efficient for harvesting peanut in rainy season.

During the tests the clay soil cause digging, stripping and cleaning problems. Hence the new peanut harvesting equipment was designed to provide proper and efficient digging blade (V-shaped) with the following added features: Suitable clearance between cylinders and their concave (35 mm), suitable spacing between concave bars (25 mm) and conveyor wire mesh (20 mm). Equipment performance test achieved good results on clayey soil (Serdang Series Soils). Results from the field test show that the equipment is suitable for harvesting peanut in a single operation. The total power requirement of a single row equipment was about 15kW (20hp).

The losses during digging, lifting, stripping and conveying were 6.23%, 8.65%, 5.06% and 1.96% respectively. Other peanut harvesters had higher

digging and stripping losses (15% and % 9.3% respectively). The equipment pods breakage scored lower percentage at 1.91 % compared with the previous designed machines (about 8.9 %). Overall efficiency was 78.1%, considered high compared with other combines efficiencies.

The peanut harvesting equipment had an average capacity of 324.9kg/h. The maximum capacity reached by the equipment was about 377.3kg/h, while the previous designed harvester had a maximum capacity of 337 kg/h.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah.

PEMBINAAN ALAT PENUAI KACANG TANAH BANTUAN KUASA TRAKTOR

Oleh

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Januari 2001

Pengerusi: Prof. Madya Ir.Dr. Desa Ahmad

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Sebuah jentera yang menggunakan traktor 35 kuasa kuda telah direka dan dibangunkan di Jabatan Kejuruteraan Biologi dan Pertanian, Universiti Putra Malaysia.

Jentera ini mengandungi bilah penggali yang boleh dilaras berbentuk V manakala sudut penusukannya dikawal dengan melaras bolt dan nat. Bilah penggali ini diikuti oleh cakera berkembar pengangkat bertujuan menarik tanaman dipermukaan tanah. Tanaman yang telah dicabut akan memasuki mekanisme peleraian yang mengandungi dua silinder berjejari bertujuan meleraikan

kekacang sebelum dihantar ke tangki dibelakang jentera menerusi alat pengangkut.

Bahan yang digunakan untuk membina bahagian jentuai adalah ringan dan tahan lasak. Berbanding jentera lain, jentera ini lebih ringan serta memudahkan pemasangan dan pengangkutan oleh sesebuah traktor.

Dalam operasi tunggal penuaian kacang tanah terutama dimusim hujan, kelembapan tanah merupakan faktor yang penting. Jentera ini direkabentuk untuk kegunaan ditanah basah dan melebihi 30% sebagaimana yang dilakukan pada jentera lain. Kajian telah dijalankan pada kelembapan 42% (asas kering).

Kajian ditanah liat menimbulkan masalah galian, peleraian dan pembersihan. Untuk mengatasi masalah tersebut bilah penggali telah dipinda kebentuk V mana kala kelegaan diantara silinder dan pelantar diubahsuai untuk menghasilkan kecekapan yang lebih baik. Jumlah kuasa yang dihasilkan oleh sebuah jentuai kacang tanah bagi satu barisan adalah 15 kW (20 kuasakuda).

Dari aspek kehilangan, peratus kehilangan yang disebabkan oleh proses galian, pencabutan, peleraian dan pengangkutan adalah masing masing 6.23, 8.65, 5.06 dan 1.96 berbanding 15% dan 9.3% kehilangan galian dan peleraian oleh jentuai lain. Pecahan kacang juga menunjukkan nilai 1.91% berbanding 8.9% oleh jentera sediaada.

Keupayaan purata jentera adalah 324.9 kg/jam manakala keupayaan maksimum adalah 377.3 kg/jam berbanding 337 kg/jam yang dihasilkan oleh jentuai lain. Kecekapan keseluruhan adalah 78.1%.

Jentuai ini telah direka, dibina dan disenggara menggunakan sumber serta kepa karan tempatan. Kos pembinaan adalah US \$ 1455. Memandangkan ia boleh beroperasi ditanah basah,ia dijangka sesuai digunakan dimusim hujan.

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I certify that an Examination Committee met on 5 January 2001 to conduct the final examination of Elnougomi Abdelgadir Omer on his Doctor of Philosophy thesis entitled "Development of a Tractor Mounted Peanut Harvesting Equipment" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:


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I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.



ELNOUGOMI ABDELGADIR OMER MUSSAD,

Date : 12 January 2001

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